Simpson

INSTRUMENTS THAT STAY ACCURATE

OPERATOR'S MANUAL

MILLIOHMMETER
MODEL 657

SIMPSON ELECTRIC COMPANY

5200 W. Kinzie St., Chicago 44, Illinois, ES 9-1121

In Canada, Bach-Simpson, Ltd., London, Ontario

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2½" RECTANGULAR
ACCURACY: ±2%
SCALE LENGTH: 1⅞"

3½" RECTANGULAR
ACCURACY: ±2%
SCALE LENGTH: 2⁹⁄₁₆"

2½", 3½", 4½" WIDE VUE
ACCURACY: ±2%

2½" or 3½" ROUND
ACCURACY: ±2%
SCALE LENGTH: 1⅞"

EDGEWISE
ACCURACY: DC ±2%
SCALE LENGTH: 1⅞"

ELAPSED TIME INDICATOR
110/220 VOLTS

See the Simpson **ADD-A-TESTER ADAPTERS** they will increase the versatility of your 260 or 270 VOM'S.

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Model 650 ..... $26.95

DC VTVM
Model 651 ..... $32.95

TEMPERATURE TESTER
Model 652 ..... $38.95

AC AMMETER
Model 653 ..... $18.95

AUDIO WATTMETER
Model 654 ..... $18.95

MICROVOLT ATTENUATOR
Model 655 ..... $18.95

BATTERY TESTER
Model 656 ..... $19.95

OPERATOR'S MANUAL

MILLIOHMMETER MODEL 657

SIMPSON ELECTRIC COMPANY

5200 W. KINZIE ST., CHICAGO 44, ILLINOIS

TELEPHONE ESTEBROOK 9-1121

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FIGURE 1 - SIMPSON MILLIOHMMETER

MODEL 657

*Trade Mark Registered U.S. Patent Office

OPERATOR'S MANUAL
SIMPSON MILLIOHMMETER ADAPTER
MODEL 657

SECTION I
GENERAL DESCRIPTION

INTRODUCTION

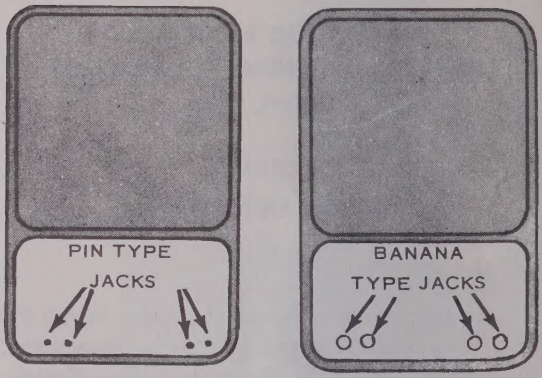
The Simpson Milliohmmeter Adapter Model 657 is a compact, accurate, wide range instrument. When it is used in conjunction with a Simpson **260*** or **270**, resistance values from 2 milliohms to 1 ohm can be measured in four ranges.

The Simpson VOM-plus-adapter concept is completely unique in approach and versatility. Each of the adapter models, of which the Milliohmmeter is but one example, provides specific measurement and testing capabilities at a fraction of the cost normally required for separate testers.

ACCESSORIES FURNISHED

Each instrument is furnished with an Operator's Manual and four extra pin-type plugs. The four pin-type plugs are used only when the Model 657 is to be used with a **260** Series II (see figure 2 for **260** Series II and Series III identification).

*Trade Mark Registered U.S. Patent Office



(a) 260, Series II (b) 260, Series III

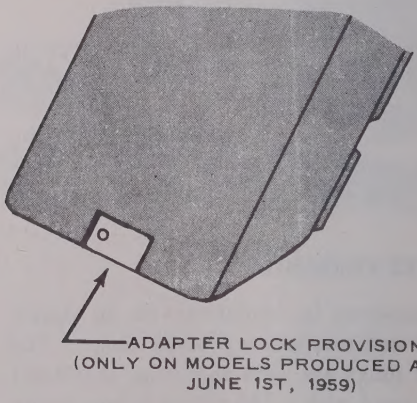


FIGURE 2 – 260 SERIES IDENTIFICATION

SPECIFICATIONS

Ranges: 0-.1 ohm F.S.
0-.25 ohm F.S.
0-.5 ohm F.S.
0-1.0 ohm F.S.

Accuracy: Adapter only; ± 1%
Adapter with 260; ± 2%
Adapter with 270; ± 1½%

Power Input: None required

Size: 5-5/16 x 4-3/8 x 3-7/16 inches

Weight: 2 pounds, 2 ounces

Battery Life: 1.5v - 150 hours nominal
9v - 250 hours nominal

Test Current: 156 milliamperes maximum

MODIFICATION KITS

Adapter Case Kit 401 for 260 Series III and 270.

Use of this kit is optional. The kit converts the **260** Series III or the **270** VOM produced prior to June 1, 1959. It consists of a modified case which permits latching the Model 657 securely to the underside of the multitester.

Adapter Case Kit 402 for 260 Series II

Use of this kit is required for this adapter. It includes a modified case which permits latching the Model 657 securely to the underside of

the multimeter, and also provides a 50 μA D.C. current range for the **260**. The 50 microampere range is required for this and other adapter models.

CONTROLS AND CONNECTORS

RANGE SWITCH

This is a five-position rotary switch located in the center of the front panel. The switch positions are marked OFF, 0.1, 0.25, 0.5, and 1.0 ohm. It is used as a range switch and as a power off - 260 Direct switch.

LEVER SWITCH

This switch, located at the bottom center of the front panel, is marked ZERO ADJ. - F.S. ADJ. - READ. When the switch is set at ZERO ADJ., it permits adjustment of the ZERO ADJ. control. When set at F.S., it permits adjustment of the F.S. control. Setting the switch at READ permits the value of the resistance being measured to be read on the proper **260/270** scale.

ZERO ADJ. CONTROL

The ZERO ADJ. control is located in the lower left corner of the front panel. When the lever switch is in the ZERO ADJ. position, it is used to set the meter current to zero.

F. S. ADJ. CONTROL

The F.S. ADJ. control is located in the lower right corner of the front panel. With the RANGE switch set at the proper range and the lever switch in the F.S. ADJ. position, this control is used to adjust for a full scale meter reading.

657 INPUT

The 657 INPUT, located to the right of the RANGE switch, consists of a pair of internally connected two conducter leads with special insulated alligator clips for connection to the unknown resistance.

260 DIRECT JACKS

The 260 DIRECT jacks are located at the left side of the RANGE switch. When the RANGE switch is set at OFF, these jacks are connected directly to the **260/270** input jacks marked + and COMMON −. This allows the use of the VOM without detaching the Model 657.

SECTION II

OPERATING INSTRUCTIONS

1. Initial Adjustments

a. 260/270 Control Settings (see figure 3)

1. With the Model 657 disconnected, check the meter pointer position for zero indication in its operating position. If the pointer is off zero, adjust the bakelite screw under the meter. Refer to the VOM Operator's Manual for further information on this adjustment.

2. Set the **260/270** polarity switch to the + DC position.

3. Set the **260/270** range switch to the 50V position.

b. Connecting the Model 657 to the VOM

1. Insert the top four plugs of the Model 657 into the lower four jacks of the **260/270.**

2. Insert the short lead from the Model 657 into the 50 μAMP jack.

3. Position the adapter locking latch underneath the instrument to secure the two units.

CAUTION

If your **260/270** does not have the locking provision, avoid applying excessive pressure to the top of the Adapter when it is used in in the Adjust-A-View position. A modification kit, which includes a new case with an adapter locking provision, is recommended for optimum rigidity (see page 3).

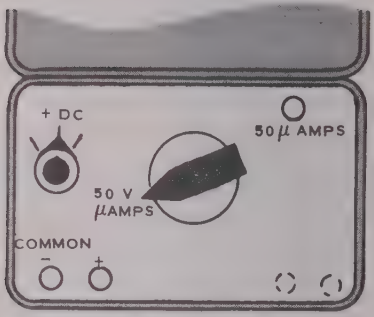
c. Model 657 Control Settings

1. Set the LEVER switch to the ZERO ADJ. position.
2. Set the RANGE switch to a position which is consistent with the resistance being measured. If the resistance to be measured is unknown, set the RANGE switch to the 1.0 ohm range and reset to a lower range if necessary for a more accurate reading.
3. Adjust the ZERO ADJ. control for a zero meter reading.

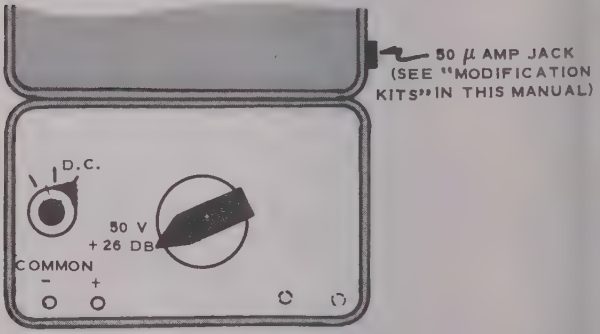
NOTE

The maximum test current (current through the resistance being measured) is:

0.1 ohm range – 156 ma
0.25 ohm range – 107 ma
0.50 ohm range – 91 ma
1.00 ohm range – 86 ma



(a) Model 260 Series III, Control Positions and Jack used with Model 656.



(b) Modified Model 260 Series II, Control Positions and Jack used with Model 656.

FIGURE 3 – MODEL 260 CONTROL POSITIONS FOR USE WITH MODEL 657

2. Measuring Resistance

a. Connect the Model 657 test leads across the resistance to be measured.

b. Set the LEVER switch to F.S. ADJ. position.

c. Adjust the F.S. ADJ. control for a full scale meter reading.

d. Set the lever switch to ZERO ADJ. position.

e. Adjust the ZERO ADJ. control for a zero meter reading.

f. Repeat steps b and c.

g. Set the LEVER switch to the READ position, and read the resistance value on the linear D.C. scales as follows:

0.1 ohm Range – use 0 - 10 instrument scale and divide reading by 100, or multiply reading by 0.01.

0.25 ohm Range – use 0 - 250 instrument scale and divide reading by 1000, or multiply reading by 0.001.

0.5 ohm Range – use 0 - 50 instrument scale and divide reading by 100, or multiply reading by 0.01.

1.0 ohm Range – use 0 - 10 instrument scale and divide reading by 10, or multiply reading by 0.1.

h. Return the LEVER switch to the ZERO ADJ. position, turn the RANGE switch to the OFF position, and disconnect the test leads from the external resistance.

CAUTION

Do not disconnect the test leads from the resistance before the lever switch is returned to the F.S. ADJ. or the ZERO ADJ. position. When the LEVER switch is in the READ position and the test leads are removed from the unknown resistance, it causes the meter to read beyond full scale. This overload is considerably less than the overload capability of the meter. However, in the case of any precision instrument, repeated overloads should be avoided.

3. Using the VOM Circuit while the Model 657 is Attached

a. Set the RANGE switch of the Model 657 to the OFF position.

b. Connect the regular VOM test leads to the 260 DIRECT jacks at the left side of the Model 657. Proceed with the standard operating instructions for the VOM according to its Operator's Manual.

SECTION III

THEORY OF OPERATION

GENERAL

The operation of the Model 657 is based upon the principle of direct comparison of the resistance under measurement with a known internal resistance. This is accomplished by passing a current through the series combination of the two resistances, and consecutively measuring their voltage drops. The principle is outlined in the following simplified schematic and operating instructions.

1. Connect test leads to Rx as at A and B.
2. Set S1 to CAL to measure the voltage drop across Rstd.
3. Adjust R1 to produce a full scale reading on the **260/270.**
4. Set S1 to "READ" position and read RX directly on the DC meter scales. This, of course, assumes that Rx is equal to or less than the Rstd selected.

NOTES

a. The low contact resistances of S1 and potential contacts "A" of the test lead clips

FIGURE 4 - MILLIOHMMETER OPERATION, SIMPLIFIED SCHEMATIC

do not introduce any significant error due to the high input resistance of the amplifier.

b. The contact resistances of the current contacts "B" of the test lead clips introduce no error since the potential measurement across Rx does not include the potential drops across these resistances.

c. The comparative nature of the two consecutive voltage measurements demands only that the system be stable for the duration of the two voltage measurements. This is accomplished by using a heavy duty battery and a DC amplifier having very good short term stability. The absolute gain of the amplifier is unimportant, as long as the amplitude response is linear.

SECTION IV

MAINTENANCE

CASE REMOVAL

To remove the instrument from the case, remove the four corner screws located on the back of the instrument case. All of the components are attached to the front panel.

BATTERY REPLACEMENT

Three batteries are located within the instrument. Two are heavy duty 1.5 volt cells, D size, held in place with a battery holder and a spring clip. To remove these batteries, open the unit as described above, remove the spring clip, and grasp both ends of the battery and pull in an outwardly direction. The other battery is a 9 volt snap type. To remove it, remove the snaps on the ends and pull out. When replacing batteries, be sure to observe the polarity as indicated by the leads and the stamping on the battery mounting plate.

PARTS REPLACEMENT

All of the components of the Model 657 have been engineered for many years of useful life. However, there are conditions under which parts may become damaged or faulty, and require replacement. Refer to the circuit diagram in figure 5 to help identify and locate any suspected part.

In the event of any component failure, order replacement parts from your nearest Simpson Authorized Parts Depot. A list of these parts depots is included, beginning on page 17 of this manual.

PARTS LIST

Reference Symbol	Description	Simpson Part No.
Resistor, 1 ohm, tapped	R1	10–860545
Potentiometer, 200 ohm ±20%, 2 w	R2	1–118726
Resistor, 18 ohms ±10%, ½ w	R3	1–118746
Resistor, 56 ohms ±10%, ½ w	R4	1–115388
Resistor, 150 ohms ±10%, ½w	R5	1–113926
Resistor, 18 ohms ±10%, ½ w	R6	1–118746
Resistor, 1K ±10%, ½ w	R7	1–111689
Potentiometer, 1K ±35%, 1/10 w	R8	1–118799
Potentiometer, 250 ohms ±30%, 1/3 w	R9	1–118727
Resistor, 2.2K ±5%, ½ w	R10	1–118748
Resistor, 2.2K ±5%, 1½ w	R11	1–118748
Potentiometer, 60 ohms ±10%, 1 w	R12	1–118763
Resistor, 390 ohms ±5%, ½ w	R13	1–118747
Resistor, 27K , ±1%, 1/4 w	R14	1–118751
Resistor, 4.7K, ±1%, 1/4 w	R15	1–118730
Diode, Silicon	D1	1–118750
Transistors, 2N591, matched (These transistors are selected on the basis of their Beta and stocked under four part numbers; any two transistors with the same part number can be used in circuit.)	T1, T2	1–118752 1–118753 1–118754 1–118755

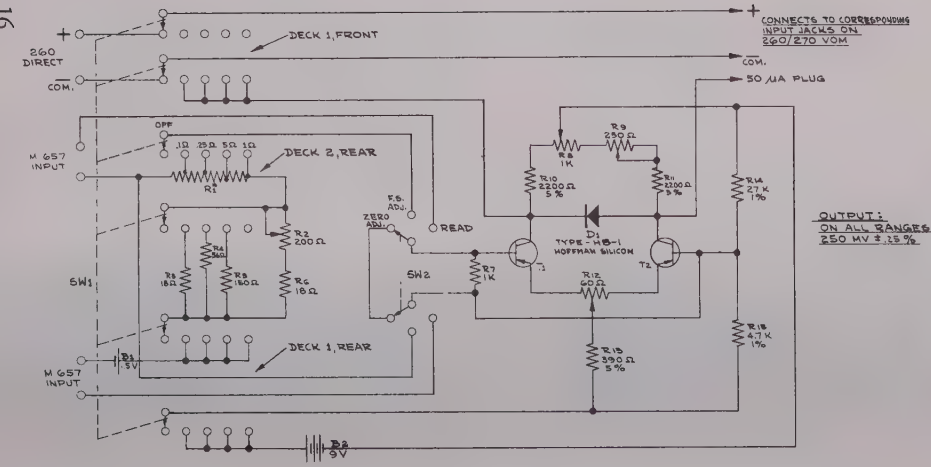


FIGURE 5 - MODEL 657 MILLIOHMMETER, OVERALL SCHEMATIC DIAGRAM

SIMPSON WARRANTY REPAIR STATIONS AND PARTS DEPOTS

*ARIZONA, PHOENIX
Metercraft, Inc. 3304 N. 24th St.
States: Arizona
Phone: CRestwood 9-5287

CALIFORNIA, LOS ANGELES
Quality Electric Co., 3700 South Broadway
States: So. California below Fresno and Arizona
Phone: ADams 2-4201

CALIFORNIA, SAN FRANCISCO
Pacific Electrical Instrument Lab., 111 Main St.
States: No. California above Fresno and Nevada
Phone: GArfield 1-7185

*CANADA, LONDON, ONTARIO
Bach-Simpson Ltd., 1255 Brydges St., P.O. Box 484
Phone: GLadstone 1-9490

COLORADO, DENVER
Meter-Master Instrument Service, 2379 S. Downing St.
States: Wyoming, Utah, Colorado, and New Mexico
Phone: RAce 2-8670

CONNECTICUT, NEW HAVEN
Kaufman Instrument Labs., Inc., 810 Dixwell Ave.
States: Connecticut
Phone: SPruce 6-7201

*Parts Depots only; no repairs
*Repair Stations only; no resale of parts.
(All others repair instruments and sell repair parts)

FLORIDA, ORLANDO
Electro Tech Corp., 307-27th Street
States: Florida
Phone: GArden 3-5589

GEORGIA, ATLANTA
Electro-Tech Equipment, 690 Murphy Ave., S.W.
States: Alabama, Georgia, Carolina and Tennessee
Phone: PLaza 3-4128

**ILLINOIS, CHICAGO
Simpson Electric Company, 5200 W. Kinzie St.
Phone: EStebrook 9-1121

*ILLINOIS, CHICAGO
Pacific Indicator Company, 5217 W. Madison St.
States: Chicago, Wisconsin and Indiana
Phone: COlumbus 1-1330

**KANSAS, KANSAS CITY
Sturtz Instrument Co., 4705 Mission Road
States: Kansas
Phone: STarline 1-4711

LOUISIANA, NEW ORLEANS
Industrial Instrument Works, 3328 Magazine St.
States: Arkansas, Mississippi and Louisiana
Phone: TWinbrook 5-5621

*Parts Depots only; no repair.
**Repair Stations only; no resale of parts.
(All others repair instruments and sell repair parts)

MASSACHUSETTS, CAMBRIDGE
Alvin C. Mancib Co., 363 Walden Street
States: Vermont, New Hampshire, Massachusetts, Rhode Island and Maine
Phone: UNiversity 4-2494

MICHIGAN, DETROIT
Ram Meter, Inc., 1100 Hilton Road, Ferndale
States: Michigan
Phone: LIncoln 7-1000

MINNESOTA, MINNEAPOLIS
Instrumentation Services, 917 Plymouth Ave.
States: Minnesota, North and South Dakota
Phone: KEllogg 7-5411

MISSOURI, ST. LOUIS
Scherrer Instruments, 5449 Delmar Blvd.
States: Illinois below Peoria, Iowa, Missouri
Phone: FOrest 7-9800

NEW YORK, BUFFALO
Electrical Instrument Labs, 932 Hertel Ave.
States: New York State except Met. New York
Phone: EXport 2-2726

NEW YORK, NEW YORK 7
Simpson Instrument Service Corp., 27 Park Place
States: Met. New York and New Jersey above Trenton
Phone: BArclay 7-4977

Parts Depots only; no repair.
Repair Stations only; no resale of parts.
(All others repair instruments and sell repair parts)

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Coverage (10 ranges)

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WARRANTY

SIMPSON ELECTRIC COMPANY warrants each instrument and other articles of equipment manufactured by it to be free from defects in material and workmanship under normal use and service, its obligation under this warranty being limited to making good at its factory any instrument or other article of equipment which shall within 90 days after delivery of such instrument or other article of equipment to the original purchaser be returned intact to it, or to one of its authorized service stations, with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, and SIMPSON ELECTRIC COMPANY neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products.

This warranty shall not apply to any instrument or other article of equipment which shall have been repaired or altered outside the SIMPSON ELECTRIC COMPANY factory or authorized service stations, nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by the manufacturer.

Simpson ELECTRIC COMPANY

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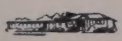
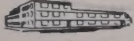


LAC DU FLAMBEAU PLANT
WISCONSIN

LAKE STREET PLANT
CHICAGO



KINZIE STREET PLANT
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AURORA, ILL.

Quality is the indispensable component
of every Simpson instrument . . . . . .